

X-CORONA

Approved For Release 2004/08/31 : CIA-RDP85B00803R000100040002-8

1956-1958



NRO review(s) completed.



WS-117L

and time required to build

If a satellite were going to be on orbit for a year (which, in consideration of the cost of placing a non-returnable vehicle in orbit, seemed probable) and return its data by the only possible method (electronically through a video link, i.e., a talk-back feature) the use of photographic film would not be productive since the amount of film required for a year would be enormous--unless the camera in use were quite advanced and able to use film only occasionally on a programmed basis.

Such a satellite would be an advanced member of the family of reconnaissance satellites, requiring a great deal of further research and development, and for the present there would still be the problem of producing a simple, less sophisticated model for more immediate use.

Thoughts then turned naturally to television-type techniques. The original RAND FEED BACK study therefore recommended this type of satellite (Refs 20-22), and Weapons System 117L was inaugurated, with Lockheed as the prime contractor and Eastman Kodak and [redacted] as sub-contractors.

In broad outline, the WS-117L was the same as that of the FEED BACK study, but differed in certain details. An ATLAS booster was used which, with auxiliary staging, would put in orbit a satellite weighing well over a ton. This satellite would carry a camera stabilized with respect to the horizons and the radius vector from the earth's center. The camera would take pictures; the photography would be processed in the satellite, scanned, and at an appropriate point in the flight path, send back to a video link to ground station.

But at about the same time the WS-117L proposals were made--in early 1956--re-entry began to appear feasible. There was an ICBM program which required re-entry; there was an intellectual and factual framework in which talk about physical recovery of data made sense and was acceptable. In 1956 RAND made a brief study of a recoverable film satellite. The system studied was based on the Atlas, but of course completely eliminated processing of the film in the satellite with subsequent scanning and playback by substituting physical recovery of the film payload. However, the satellite still required camera stabilization, and stabilization presented difficult problems. Even so, interest in recovering a film payload continued. It was easily demonstrated that the number of bits of information procured, no matter how calculated, could be made rather large if the data were recovered via the film itself instead of being telemetered back, with large prices being paid in terms of the large bandwidth required and the number of hours to communicate.

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In the late spring or early summer of 1957, a new concept was suggested by RAND. This was the possible use of a spin-stabilized panoramic camera for satellite reconnaissance over the Soviet Union. The origin of this notion is interesting. Panoramic cameras, as such, are of course, not new. One of the earliest panoramic cameras used in ground-based photography was the kind used to take pictures of graduating classes. Wide-angle pictures were taken by rotating the lens around its rear nodal point, and scanning a curved film plane. Very large panoramic cameras, noted earlier in this report, were 'flown by Geo. Lawrence in the early 1900's. In 1948, Col. Richard W. Philbrick, then attached to Boston U Physical Research Lab, had an idea for converting an S-7 strip camera to a transverse panoramic camera. This was easily done, christened the "Whirling Dervish" flown successfully, and fully reported. A photograph made with this camera was a conspicuous feature of the UN exhibit on the Eisenhower 'open-skies' plan, and the booklet on aerial inspection distributed by the U.S. Govt. The E-1 panoramic camera (built by P-E) was flown in approximately mid-1952, and worked successfully. It used a 48" focal length lens, mounted vertically; scanning was accomplished by a dove prism rotating beneath the lens. This camera produced horizon-to-horizon photographs. The Air Force subsequently developed the E-2 panoramic camera and others, some of which have some specialized application.

The notion of spin stabilization came from a RAND study of a lunar instrument carrier, which involved spin-stabilizing a vehicle so that it could land in proper orientation on the moon's surface. This notion was combined with that of the panoramic camera. Thor was suggested as a possible carrier for early simple satellites and Atlas for later more advanced ones. (Ref 32).

-- A.H. KATZ, "The Reconnaissance
Satellite (U)" U.S. Air Force
Project RAND # 24 Feb 1958.
(Secret) -
(pp. 49-50-51) -

CORONA - 19567-31 mag 1972

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Final version of this draft studies in Intell,

Vol. 17, NO. 1-5

(Supplement)

Since the propulsion required to place a satellite in orbit is of the same general order of magnitude as that required to launch an ICBM, the achievement of an ICBM-level of propulsion made it possible to begin thinking seriously of launching orbital satellites. Accordingly, General Operational Requirement No. 80 was levied in 1955 with the stated objective of providing continuous surveillance of pre-selected areas of the world to determine the status of a potential enemy's war-making capacity.

[Redacted]

(TS)

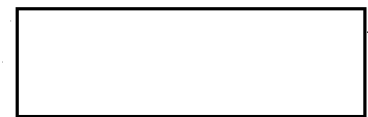
Corona by Kenneth E. Greer

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The Air Research and Development Command, which had inherited the RAND study program in 1953, assigned the satellite project to its Ballistic Missile Division. The development plan for WS-117L was approved in July 1956, and the program got under way in October 1956 with the awarding of a contract to the Lockheed Aircraft Corporation for the development and testing of the system.

The planning for WS-117L contemplated a family of separate systems and subsystems employing satellites for the collection of photographic, [Redacted] intelligence. The program, which was scheduled to extend beyond 1965, was divided into three phases. Phase I, the THOR-boosted test series, was to begin in November 1958. Phase II, the ATLAS-boosted test series, was scheduled to begin in June 1959 with the objective of completing the transition from the testing phase to the operational phase and of proving the capability of the ATLAS booster to launch heavy loads

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into space. Phase III, the operational series, was to begin in March 1960 and was to consist of three progressively more sophisticated systems: the Pioneer version (photographic [redacted]), the Advanced version (photographic [redacted]), and the Surveillance version (photographic, [redacted]). It was expected that operational control of WS-117L would be transferred to the Strategic Air Command with the initiation of Phase III.

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It was an ambitious and complex program that was pioneering in technical fields about which little was known. Not surprisingly, it had become apparent by the end of 1957 that the program was running behind schedule. It also was in trouble from the standpoint of security. The U-2 program was carried out in secret from 1956 until May 1960--not from the Soviet Government, of course, but the Soviets chose to allow the program to remain a secret from the general public (and from most of the official community) in preference to publicizing its existence and thereby admitting that they lacked the means of defending their air space against the high-flying U-2. WS-117L was undertaken as a classified project, but its very size and the number of people involved made it impossible to conceal the existence of the program for long. The press soon began speculating on the nature of the program, correctly identifying it as involving military reconnaissance

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satellites, and referring to it as BIG BROTHER and SPY IN THE SKY. The publicity was of concern, because the development of WS-117L was begun in a period when the international political climate was hostile to any form of overflight reconnaissance.

It was against this background that the President's Board of Consultants on Foreign Intelligence Activities submitted its semi-annual report to the President on 24 October 1957. The Board noted in its report that it was aware of two advanced reconnaissance systems that were under consideration. One was a study then in progress in the Central Intelligence Agency concerning the feasibility of a manned reconnaissance aircraft designed for greatly reduced radar cross-section; the other was WS-117L. The Board recommended that an early review be made of new developments in advanced reconnaissance systems to ensure that they were given adequate consideration and received proper handling in the light of then-existing and future intelligence requirements. The Executive Secretary of the National Security Council on 28 October notified the Secretary of Defense and the Director of Central Intelligence that the President had asked for a joint report from them on the status of the advanced systems. Secretary Quarles responded on behalf of himself and Mr. Dulles on 5 December with a recommendation that, because of the extreme sensitivity of the subject, details on the new systems be furnished through oral briefings.

As a consequence of that proposal, which evidently was accepted, there are no written records in CIA's Project CORONA files bearing dates between 5 December 1957 and 21 March 1958. It is clear, however, that major decisions were made and that important actions were undertaken during the period. In brief, it was decided that the photographic subsystem of WS-117L offering the best prospect of early success would be separated from WS-117L, be designated as Project CORONA, and be placed under a joint CIA-Air Force management team--an approach that had been so successful in covertly developing and operating the U-2.

The nucleus of such a team was then constituted as the Development Projects Staff under the direction of Richard Bissell, who was Special Assistant to the DCI for Plans^{ing} and Development. Bissell was designated as the senior CIA representative on the new venture, and his Air Force counterpart was Brigadier General Osmund^o Ritland, who, as Colonel Ritland, had served as Bissell's first deputy in the early days of the Development Projects Staff and was then Vice Commander of the Air Force Ballistic Missile Division.

Bissell recalls that he first learned of the new program and of the role intended for him in it "in an odd and informal way" from Dr. Edwin Land with whom he had worked on the development of the U-2 reconnaissance system and who had come to head a panel of technical

consultants informally known as the Land Panel. Bissell also recalls that his early instructions were extremely vague: that the subsystem was to be split off from WS-117L, that it was to be placed under separate covert management, and that the pattern established for the development of the U-2 was to be followed. One of the instructions, however, was firm and precise: none of the funds for the new program were to come from monies authorized for already approved Air Force programs. This restriction, although seemingly clear at first glance, later led to disagreement over its interpretation. CORONA management expected that the boosters already approved for the THOR test series of WS-117L would simply be diverted to the CORONA program; this proved not to be so. As a consequence, CIA had to go back to the President with an admission that the original project proposal had understated the estimated cost and with a request for more money.

Roughly concurrent with the decision to place one of the WS-117L subsystems under covert management, the Department of Defense realigned its structure for the management of space activities. The Advanced Research Projects Agency (ARPA) was established on 8 February 1958 and was granted authority over all military space projects. The splitting off of CORONA from WS-117L was accomplished by an ARPA directive of 28 February 1958 assigning responsibility for the WS-117L program to the Air Force and ordering

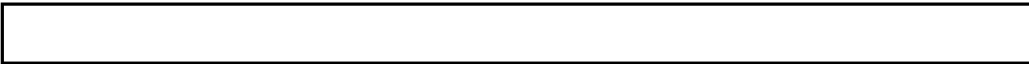
that the proposed WS-117L interim reconnaissance system employing THOR boost be dropped.

The ARPA directive ostensibly cancelling the THOR-boosted interim reconnaissance satellite was followed by all of the notifications that would normally accompany the cancellation of a military program. The word was passed officially within the Air Force, and formal contract cancellations were sent out to the prospective suppliers. There was much furore when the cancellations went out: contractors were furious over the suddenness of the action; Air Force personnel were thunderstruck at the abandonment of the WS-117L photographic subsystem that seemed to have the best chance of early success. Subsequent to the cancellation, very limited numbers of individuals in the Air Force and in the participating companies were cleared for Project CORONA and were informed of the procedures to be followed in the covert reactivation of the cancelled program.

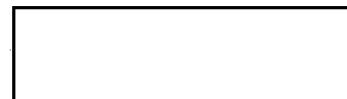
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After Bissell and Ritland had worked out the arrangements for  they then began tackling the technical problems associated with the design configuration they had inherited from WS-117L. The subsystem in point contemplated the use of the THOR IRBM as the first stage booster and, as a second stage, a Lockheed-modified rocket engine that had been developed by Bell Aircraft for take-off assist and auxiliary power applications in the B-58 HUSTLER bomber. It was referred to as the HUSTLER engine during the development phase of CORONA but soon came to be known as the AGENA, the name it bears today. The plan called for spin stabilization of the pod containing the payload, with the camera scanning as the pod rotated. The camera was to have a focal length of six inches, without image motion compensation, and would require the use of fast film. The film was to be fed into a capsule, which would be recovered from orbit. Ground resolution was expected to be poor because of the short camera focal length and the grainy photography yielded by fast film. The contractors who had been working on the subsystem design were Lockheed on the space vehicle, General Electric on the re-entry body, and Fairchild on the camera.

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The initial intent of the CORONA managers was to proceed with the configuration described above. As will be seen later, this was not the configuration that was finally chosen. The ground resolution attainable by it would not meet intelligence needs, and by late March 1958 major complications had arisen in the technical design of the Fairchild camera.

A three-day conference was held in San Mateo, California, in late March among representatives of CIA, Air Force Ballistic Missile Division, Lockheed, General Electric, and Fairchild. Their discussion revealed that, while work was going forward, the design was far from complete. The senior Lockheed representative reported that they had investigated the possibility of building a satellite vehicle shaped like a football, a cigar, or a sphere. They had finally decided, for the original drawings at least, on a football-shaped pod slightly elongated at each end to correct the center of gravity. Discussion got onto the need for immediate contractual arrangements with the various suppliers. Bissell remarked that he was "faced with the problem at present of being broke" and would need estimates from all of the suppliers as soon as possible in order to obtain the necessary financing to get the program under way. The suppliers agreed to furnish(ed) the required estimates by the following week.

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The project quickly began taking formal shape following that meeting. Within a span of about three weeks, approval of the program and of its financing was obtained, and the design of the payload configuration evolved into a concept quite different from the spin-stabilized pod. In late March and early April, interest shifted to a competitive design submitted by the ITEK Corporation, which proposed a longer focal length camera scanning within an earth-center stabilized pod. Bissell recalls that he personally decided in favor of the ITEK design, but only after much agonizing. The decision was plainly a difficult one to make, because it involved moving from a proven and relatively simple method of stabilization, to one that was untried and was technically more difficult to accomplish. Nor, for that matter, was the decision taken in a single step.

Bissell's first project proposal, which was completed on 9 April 1958, requested approval for concurrent development of both the Fairchild and the ITEK systems, with the Fairchild configuration becoming operational first and the ITEK configuration being developed as a follow-on system. Within two days, however, Bissell had made the final decision to abandon the Fairchild spin-stabilized configuration entirely. He rewrote the project proposal, taking note of the earlier configuration and giving his reasons for favoring the ITEK approach (principally the better

25X1 resolution attainable, the lower overall cost, and the greater
25X1 potential for growth). The proposal was rewritten a second time,
retaining the ITEK configuration but raising the cost estimate
from [] Of the total estimated cost,
[] represented "a rather arbitrary allowance" for 12 each
THOR boosters and Lockheed second stage vehicles and was to be
financed by ARPA through the Air Force. The remaining []
25X1 was for [] by CIA of the pods containing the
reconnaissance equipment and the recoverable film cassettes.

The final project proposal was forwarded to Brigadier General Andrew J. Goodpaster, the President's Staff Secretary, on 16 April, 1958 after having been reviewed by Mr. Roy Johnson and Admiral John Clark of ARPA; Mr. Richard Horner, Assistant Secretary of the Air Force for Research and Development; Brigadier General Osmund Ritland, Vice Commander, Air Force Ballistic Missile Division; and Dr. James Killian, Special Assistant to the President for Science and Technology. The proposal was approved, although not in writing. The only original record of the President's approval reportedly was in the form of a handwritten note on the back of an envelope by General Cabell, then Deputy Director of Central Intelligence.

Although it may have been the original intent that CORONA would be administered in a manner essentially the same as that of the U-2 program, it actually began and evolved quite differently.